

## Problems

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### 1 Elementary First Set

1. Simplify

$$\frac{\frac{3}{4}}{\frac{9}{10}}$$

2. Perform the indicated operation and express your answer in lowest terms

$$\frac{1}{2} + \frac{2}{5} - \frac{2}{4}$$

3. Perform the indicated operation and express your answer in lowest terms

$$\frac{1}{3} - \frac{2}{5} + \frac{2}{4}$$

4. Simplify

$$\frac{\frac{3}{5} + \frac{1}{5}}{\frac{4}{7} - \frac{1}{7}}$$

5. Simplify

$$\frac{x}{xy}$$

6. Simplify

$$\frac{x^2 + x}{x^3}$$

7. Simplify

$$\frac{(x - 2)}{(x + 3)(x - 2)}$$

8. F.O.I.L. the expression

$$(x - 1)(x + 1)$$

9. F.O.I.L. the expression

$$(x - 1)(x + 3)$$

10. Simplify

$$\frac{x^2 - 1}{x^2 + 2x - 3}$$

11. Perform the indicated operation and express your answer in lowest terms.

$$\frac{1}{2} + \frac{1}{x}$$

## 2 Middle First Set

1. Simplify

$$\frac{x}{xy}$$

2. Simplify

$$\frac{x^2 + x}{x^3}$$

3. Simplify

$$\frac{(x - 2)}{(x + 3)(x - 2)}$$

4. F.O.I.L. the expression

$$(x - 1)(x + 1)$$

5. F.O.I.L. the expression

$$(x - 1)(x + 3)$$

6. Simplify

$$\frac{x^2 - 1}{x^2 + 2x - 3}$$

7. Perform the indicated operation and express your answer in lowest terms.

$$\frac{1}{2} + \frac{1}{x}$$

8. Perform the indicated operation and express your answer in lowest terms.

$$\frac{1}{x} - \frac{3}{2y}$$

9. Perform the indicated operation and express your answer in lowest terms.

$$\frac{2}{x^2} \times \frac{x}{x + 1}$$

10. Perform the indicated operation and express your answer in lowest terms.

$$\frac{x}{2} \div \frac{1}{x}$$

11. Simplify

$$\frac{1 + \frac{1}{x}}{\frac{x}{2} + 2}$$

### 3 High First Set

1. Simplify

$$\frac{x^2 - 1}{x^2 + 2x - 3}$$

2. Simplify

$$\frac{x^2 - 4}{x^3 - 8}$$

3. Perform the indicated operation and express your answer in lowest terms.

$$\frac{1}{2} + \frac{1}{x}$$

4. Perform the indicated operation and express your answer in lowest terms.

$$\frac{1}{2x} + \frac{1}{x^2} + \frac{1}{x+1}$$

5. Perform the indicated operation and express your answer in lowest terms.

$$\frac{1}{x} - \frac{3}{2y}$$

6. Perform the indicated operation and express your answer in lowest terms.

$$\frac{2}{x} - \frac{3}{4y} + \frac{8}{5z}$$

7. Perform the indicated operation and express your answer in lowest terms.

$$\frac{2}{x^2} \times \frac{x}{x+1}$$

8. Perform the indicated operation and express your answer in lowest terms.

$$\frac{x}{2} \div \frac{1}{x}$$

9. Simplify

$$\frac{1 + \frac{1}{x}}{\frac{x}{2} + 2}$$

10. Simplify

$$\frac{\sqrt{x+1} + \frac{1}{\sqrt{x+1}}}{(x+1)^2}$$

## 4 Elementary Second Set

1. Perform the indicated operation and express your answer in lowest terms.

$$\frac{1}{x} - \frac{3}{2y}$$

2. Perform the indicated operation and express your answer in lowest terms.

$$\frac{2}{x^2} \times \frac{x}{x+1}$$

3. Perform the indicated operation and express your answer in lowest terms.

$$\frac{x}{2} \div \frac{1}{x}$$

4. Simplify

$$\frac{1 + \frac{1}{x}}{\frac{x}{2} + 2}$$

5. Perform the indicated operation and express your answer in lowest terms.

$$\frac{x+5}{x^2-16} \div \frac{x^2-25}{x-4}$$

6. Simplify

$$\frac{1 - \frac{9}{x^2}}{1 + \frac{5}{x} + \frac{6}{x^2}}$$

7. Perform the indicated operation and express your answer in lowest terms.

$$\frac{x}{x+3} + \frac{x+2}{x+5}$$

8. Perform the indicated operation and express your answer in lowest terms.

$$\frac{x+4}{x^2+5x+5} \times \frac{x+3}{x^2-16}$$

9. Perform the indicated operation and express your answer in lowest terms.

$$\frac{2}{x^2-9} - \frac{3x}{x^2-5x+6}$$

10. Perform the indicated operation and express your answer in lowest terms.

$$\frac{x+4}{x^2-5x+6} \div \frac{x^2-16}{x+3}$$

## 5 Middle Second Set

1. Simplify

$$\frac{x^2 - 1}{x^2 + 2x - 3}$$

2. Simplify

$$\frac{x^2 - 4}{x^3 - 8}$$

3. Perform the indicated operation and express your answer in lowest terms.

$$\frac{1}{2} + \frac{1}{x}$$

4. Perform the indicated operation and express your answer in lowest terms.

$$\frac{1}{2x} + \frac{1}{x^2} + \frac{1}{x+1}$$

5. Perform the indicated operation and express your answer in lowest terms.

$$\frac{1}{x} - \frac{3}{2y}$$

6. Perform the indicated operation and express your answer in lowest terms.

$$\frac{2}{x} - \frac{3}{4y} + \frac{8}{5z}$$

7. Perform the indicated operation and express your answer in lowest terms.

$$\frac{2}{x^2} \times \frac{x}{x+1}$$

8. Perform the indicated operation and express your answer in lowest terms.

$$\frac{x}{2} \div \frac{1}{x}$$

9. Simplify

$$\frac{1 + \frac{1}{x}}{\frac{x}{2} + 2}$$

10. Simplify

$$\frac{\sqrt{x+1} + \frac{1}{\sqrt{x+1}}}{(x+1)^2}$$

## 6 High Second Set

1. Perform the indicated operation and express your answer in lowest terms.

$$\frac{x}{x+3} + \frac{x+2}{x+5}$$

2. Perform the indicated operation and express your answer in lowest terms.

$$\frac{x+4}{x^2+5x+5} \times \frac{x+3}{x^2-16}$$

3. Perform the indicated operation and express your answer in lowest terms.

$$\frac{2}{x^2-9} - \frac{3x}{x^2-5x+6}$$

4. Perform the indicated operation and express your answer in lowest terms.

$$\frac{x+4}{x^2-5x+6} \div \frac{x^2-16}{x+3}$$

5. Simplify

$$\frac{x^3-8}{x^3+2x^2-5x-6}$$

6. Perform the indicated operation and express your answer in lowest terms.

$$\frac{x^2+4x+3}{2x^2-x-10} \times \frac{2x^2+4x^3}{x^2+3x} \times \frac{x}{x^2+3x+2}$$

7. Perform the indicated operation and express your answer in lowest terms.

$$\frac{x^2+1}{2x^2-4x+2} + \frac{x}{(x-1)^2} - \frac{x+1}{x^2-2x+1}$$

8. Perform the indicated operation and express your answer in lowest terms.

$$\frac{x^2-10x+25}{x^2-10x+24} \left( \frac{x^2-2x-8}{x^2-6x+5} \div \frac{x-5}{x-1} \right)$$

9. Perform the indicated operation and express your answer in lowest terms.

$$\left[ \left( \frac{1}{b} - b \right) \div \left( 1 - \frac{1}{b} \right) (1+b) \right]$$

10. Solve the equation

$$\frac{-3x}{x+1} + \frac{4x+1}{x} = \frac{-3}{x^2+x}$$

## 7 Bonus Problems

1. Simplify the rational expression

$$\frac{a^2x^3y^4}{a^4x^3y^2}.$$

2. Simplify the rational expression

$$\frac{(x+y)^4}{(x+y)^5}.$$

3. Simplify the rational expression

$$\frac{6y^3z}{2yz^2}$$

4. Simplify the rational expression

$$\left(\frac{a^2}{b}\right)^5 \left(\frac{a^3b^2}{c^3}\right)^3$$

5. Simplify the rational expression

$$\frac{(8s^3t^3)^{\frac{2}{3}}}{(s^4t^{-8})^{\frac{1}{4}}}$$

6. Simplify the rational expression

$$\left(\frac{x^{-\frac{2}{3}}}{y^{\frac{1}{2}}}\right) \left(\frac{x^{-2}}{y^{-3}}\right)^{\frac{1}{6}}$$

7. Simplify the expression

$$\frac{x^2y^3z}{xyz^2 + x^2y^{\frac{1}{2}}z^3}$$

8. Simplify the expression

$$\frac{\sqrt{x} - \frac{2}{\sqrt{x}}}{x^{\frac{3}{2}}}$$

9. Simplify

$$\frac{x^{\frac{2}{3}} - 2x^{-\frac{1}{3}} + x^{-\frac{4}{3}}}{x^2 - 1}$$

10. Simplify

$$\frac{(y+4)^{\frac{2}{3}} - (y+4)^{-\frac{4}{3}}}{(y+4)^{\frac{2}{3}}}$$

11. Simplify

$$\frac{(y^5 + 2y^4)^{\frac{1}{2}} - (16y + 32)^{\frac{1}{2}}}{y - 2}$$